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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,774	02/19/2004	Takashi Shirakawa	023971-0374	2066

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EXAMINER	
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ART UNIT	PAPER NUMBER
3748	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/780,774	SHIRAKAWA ET AL.	
	Examiner	Art Unit	
	TU M. NGUYEN	3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-5 and 7-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-5,7,12,16 and 19-22* is/are rejected.

7)☒ Claim(s) *8-11,13-15,17 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. An Applicant's Request for Reconsideration filed on January 4, 2008 has been entered. Overall, claims 1, 3-5, and 7-22 are pending in this application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3, 4, 7, 12, and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. (U.S. Patent 6,263,667) in view of Ito et al. (U.S. Patent 5,655,363).

Re claims 1 and 19-22, as shown in Figures 1, 2, 3, 7, 11, and 12, Sawada et al. disclose an exhaust gas purifying apparatus and an exhaust gas purifying method for an internal combustion engine (1), the apparatus comprising:

- an NOx removing catalyst (7) that absorbs nitrogen oxides in an exhaust gas of the engine when an air-fuel ratio of the exhaust gas streaming thereinto is lean and that releases and reduces the absorbed nitrogen oxides therefrom when the air-fuel ratio of the exhaust gas streaming thereinto is rich (lines 56-67 of column 9);

- an exhaust gas atmosphere varying section (30) that varies a ratio (air-fuel ratio) between an oxidizing agent in the exhaust gas and a reducing agent therein;

- a first exhaust gas atmosphere detecting section (31) disposed in an upstream side of an exhaust passage with respect to the NOx removing catalyst to detect the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein;

- a second exhaust gas atmosphere detecting section (33) disposed in a downstream side of the exhaust passage with respect to the NOx removing catalyst to detect the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein; and

- an abnormality determining section (30, Figures 7 and 12) that executes an abnormality determination of the NOx removing catalyst on the basis of output values of both of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section from a time at which the output value (AFU) of the first exhaust gas atmosphere detecting section is varied to a first predetermined value (RICH, see Figure 2(A)) to a time at which the output value (AFD) of the second exhaust gas atmosphere detecting section reaches a second predetermined value (RICH, see Figure 2(B)) when the exhaust gas atmosphere varying section increases the ratio between the reducing agent and the oxidizing agent in the exhaust gas,

wherein the abnormality determining section (see Figures 11-12) calculates (in step 1123) an integration quantity (CATDOL) with respect to time on the basis of a previous integration quantity with respect to time and a difference (DAFS) between the output value (AFU) of the first exhaust gas atmosphere detecting section and the output value (AFD) the second exhaust gas atmosphere detecting section and executes (in step 1211) the abnormality determination of the NOx removing catalyst on the basis of the calculated integration quantity (CATDOL) of the

difference (DAFS) when the exhaust gas atmosphere varying section increases the ratio between the oxidizing agent and the reducing agent in the exhaust gas.

Sawada et al., however, fail to disclose that the abnormality determining section suspends the abnormality determination of the NOx removing catalyst when the difference of the output values of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section is larger than a third predetermined value when the output value of the second exhaust gas atmosphere detecting section reaches the second predetermined value.

As shown in Figure 1, Ito et al. disclose an air-fuel ratio control system for an internal combustion engine having a catalyst (14), an upstream oxygen sensor (15), and a downstream oxygen sensor (16). As depicted in Figure 4, Ito et al. teach that it is conventional in the art to suspend (steps S83-S84 are terminated) an abnormality determination of the catalyst and a sulfur purge (step S85) is performed when the catalyst is determined to be sulfur poison; wherein the catalyst is sulfur poisoned when a difference of output values of the upstream oxygen sensor and the downstream oxygen sensor exceeds a predetermined value (see Figure 10 and line 66 of column 11 to line 10 of column 12). It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Ito et al. in the apparatus and method of Sawada et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to remove sulfur poison from a catalyst to maintain a high NOx purification efficiency.

Re claim 3, in the modified apparatus of Sawada et al., each of the first exhaust gas atmosphere detecting section (31) and the second exhaust gas atmosphere detecting section (33) detects an oxygen concentration in the exhaust gas.

Re claim 4, in the modified apparatus of Sawada et al., each of the first exhaust gas atmosphere detecting section (31) and the second exhaust gas atmosphere detecting section (33) detects an air-fuel ratio of the exhaust gas.

Re claim 7, in the modified apparatus of Sawada et al., the first exhaust gas atmosphere detecting section comprises an upstream side oxygen concentration sensor (31) disposed at the upstream side of the exhaust passage with respect to the NOx removing catalyst and the second exhaust gas atmosphere detecting section comprises a downstream side oxygen concentration sensor (33) disposed at the downstream side of the exhaust passage with respect thereto and wherein the abnormality determining section executes the abnormality determination of the NOx removing catalyst for an interval of time (TSTR) at which the output value of the downstream side oxygen concentration sensor is maintained within a predetermined range in the vicinity to a stoichiometric air-fuel ratio when the exhaust gas atmosphere varying section increases the ratio of the reducing agent in the exhaust gas, as clearly shown in Figures 2(A) and 2(B).

Re claim 12, in the modified apparatus of Sawada et al., the first and second exhaust gas atmosphere detecting sections comprise an upstream side lambda sensor (31) and a downstream side lambda sensor (33), respectively, and wherein the apparatus further comprises an excess air ratio calculating section that calculates an upstream side excess air ratio (upstream air-fuel ratio) at the upstream side of the NOx removing catalyst on the basis of a pump current value of the upstream side lambda sensor and calculates a downstream side excess air ratio (downstream air-fuel ratio) at the downstream side of the NOx removing catalyst on the basis of the pump current value of the downstream side lambda sensor.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. in view of Ito et al. as applied to claim 4 above, and further in view of Bidner et al. (U.S. Patent 6,763,656).

The modified apparatus of Sawada et al. discloses the invention as cited above, however, fails to disclose that instead of an oxidant storage amount in the NOx catalyst, the abnormality determining section calculates an extra HC quantity in the exhaust gas on the basis of the detected exhaust gas air-fuel ratio and an intake fresh air quantity.

As shown in Figure 1, Bidner et al. disclose an air-fuel ratio control for an internal combustion engine having a NOx trap (36), an upstream oxygen sensor (38), and a NOx sensor (40). As depicted in Figures 8 and 9 and indicated in claims 1 and 3, Bidner et al. teach that it is conventional in the art to compute an extra HC amount in the exhaust gas on the basis of the detected exhaust gas air-fuel ratio and an intake fresh air quantity. And a NOx purge of the NOx trap is terminated a difference between the extra HC amount in the exhaust gas at the upstream side of the NOx trap and the extra HC amount in the exhaust gas at the downstream side of the NOx trap exceeds a threshold value. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Bidner et al. in the modified apparatus of Sawada et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art.

5. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. in view of Ito et al. and Bidner et al. as applied to claim 5 above, and further in view of Adamczyk, Jr. et al. (U.S. Patent 5,524,433).

The modified apparatus of Sawada et al. discloses the invention as cited above, however, fails to disclose the procedure to calculate an extra HC quantity in the exhaust gas on the basis of the detected exhaust gas air-fuel ratio and an intake fresh air quantity.

As shown in Figure 3, Adamczyk, Jr. et al. disclose an apparatus to monitor the performance of a hydrocarbon engine emission trapping device (31) having an upstream lambda sensor (56) and a downstream lambda sensor (57). As indicated on line 29 of column 5 to line 4 of column 6, Adamczyk, Jr. et al. teach that it is conventional in the art to compute an excess HC amount stored or desorbed from the trapping device is by calculating HC amounts at an upstream location and a downstream location of the device; wherein the HC amount is based on an excess air ratio determined from a lambda sensor and an intake air quantity. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Adamczyk, Jr. et al. in the modified apparatus of Sawada et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art.

Allowable Subject Matter

6. Claims 8-11, 13-15, 17, and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

7. Applicant's arguments with respect to the references applied in the previous Office Action have been fully considered but they are not persuasive.

In response to applicant's argument that the combination of Ito et al. and Sawada et al. is improper because the two references are directed to different and unrelated issues (i.e., Sawada et al. are concerned with a catalyst's occluding and reducing ability of NOx; and Ito et al. are concerned with sulfur poisoning of a catalyst) (page 14 of the Applicant's Request), the examiner respectfully disagrees.

The occluding and reducing catalyst (7) in Sawada et al. is adapted to trap NOx emissions in an exhaust gas stream when the gas is lean of stoichiometry. When the catalyst is deemed saturated with NOx, an air-fuel ratio of the exhaust gas stream is switched to stoichiometry or rich to heat up the catalyst for the release and reduction of the trapped NOx. Sawada et al. fail to recognize that sulfur is also present in a fuel; and SOx emissions are generated during the combustion of the fuel in the engine. The SOx emissions are present in the exhaust gas stream resulted from the combustion and are trapped by a typical occluding and reducing catalyst such as the one used by Sawada et al. Since the trapped SOx emissions require a much higher temperature to be released from the trap, a normal NOx purge in Sawada et al. will not release the trapped SOx; and the catalyst in Sawada et al. will eventually lose a NOx trapping efficiency.

The reference of Ito et al. is then introduced to teach that SOx emissions are detrimental to a catalyst's performance and need to be purged from a catalyst in order to regain a catalyst's full NOx purification efficiency. Ito et al. teach that their catalyst is SOx poisoned when a

difference of output values of an upstream oxygen sensor (15) and a downstream oxygen sensor (16) exceeds a predetermined value (see Figure 10 and line 66 of column 11 to line 10 of column 12). Ito et al. then suspend an abnormality determination of the catalyst (steps S83-S84 are terminated); and a SOx purge in step S85 is performed when the catalyst is determined to be SOx poisoned. As indicated above, by utilizing the teaching of Ito et al. in Sawada et al., one with ordinary skill in the art would be able to maintain high NOx purification efficiency in the purifying apparatus and method of Sawada et al.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Communication

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Tu M. Nguyen/

TMN

Tu M. Nguyen

July 20, 2008

Primary Examiner

Art Unit 3748